

REMARKS

This is intended as a full and complete response to the Final Office Action dated November 14, 2006, having a shortened statutory period for response set to expire on February 14, 2007. Please reconsider the claims pending in the application for the reasons discussed below.

Claims 1-5, 9-14, 17-20, 24-30, 34-38, 40, 42, 43, and 45 remain pending in the application and are shown above. Claims 1-5, 9-14, 17-20, 24-30, 34-38, 40, 42, 43, and 45 stand rejected. Reconsideration of the rejected claims is requested for the reasons presented below.

Claims 1-2, 5, 9-12, 14, 20, and 24-27 are rejected under 35 U.S.C. § 103(a) as being unpatentable over *Ramachandran, et al.* (WO-02/10480). The Examiner states that *Ramanchandran et al.* discloses a method of removing residue from a substrate using an etchant composition comprising about 0.01 to about 15 percent by weight of sulfuric acid, about 0.01 to about 20 percent by weight of hydrogen peroxide, or about 1 to about 30 ppm of ozone, and about 0.1 to about 100 ppm of hydrofluoric acid and rinsing the substrate. The Examiner states that the recitation of "about 70% or less by weight" with respect to the sulfuric acid concentration of the aqueous solution in the claims reads on 0% sulfuric acid. The Examiner asserts that mixing hydrofluoric and sulfuric acid with hydrogen peroxide at different concentrations before further diluting with water would have been obvious since it is known in the art to dilute the cleaning composition with water before cleaning a surface. The Examiner further states that Applicant has not shown any difference between compositions starting with different concentrations, which distinguish the claimed process from the cited art. Applicant respectfully traverses the rejection.

Applicant respectfully submits that the Examiner errs in interpreting the claims as reading on 0% sulfuric acid. Applicant notes that the claims recite a solution comprising sulfuric acid, and the phrase "about 70 % or less by weight" indicates that while the solution includes at least some sulfuric acid, the amount of sulfuric acid in the solution is no more than about 70% by weight.

In response to the Examiner's statement that Applicant has not shown any difference between compositions starting with different concentrations of components

that distinguish the claimed process from the cited art, Applicant respectfully submits that it is irrelevant whether there is a difference between compositions starting with different concentrations as Applicant is claiming processes of making a cleaning solution and removing residues rather than cleaning compositions. The instant specification discloses a process of making a cleaning solution with a sulfuric acid concentration of 70% or less such that there is only a small increase in temperature in the resulting cleaning solution, while the use of concentrated sulfuric acid (98%) can heat a solution to the extent that it must be cooled before use (paragraph [0018]).

Ramachandran, et al. describes a method of forming a cleaning solution that includes mixing 98 percent by weight of sulfuric acid solution with 30 percent by weight of hydrogen peroxide solution and 49 percent by weight of hydrofluoric acid solution and adding these solutions to water to provide the desired percentages of the solution components (page 6, lines 5-9). In response to the Examiner's assertion that mixing the solution components at different concentrations before further diluting with water would have been obvious because it is known to dilute cleaning compositions with water, Applicant respectfully submits that the Examiner has not identified any motivation or suggestion for using the claimed concentration of 70 % by weight or less of sulfuric acid to form an intermediate solution before further diluting the intermediate solution with water.

Therefore, *Ramachandran, et al.* does not teach, show, or suggest a method for removing a residue from a substrate surface, comprising mixing an aqueous solution comprising sulfuric acid and hydrofluoric acid, wherein a concentration of the sulfuric acid in the aqueous solution is about 70% or less by weight, with a hydrogen peroxide solution to produce an intermediate solution at a predetermined temperature of about 3°C or less higher than temperatures of the aqueous solution and the hydrogen peroxide solution, diluting the intermediate solution with water to form a cleaning solution, wherein the cleaning solution comprises hydrogen peroxide at a concentration within a range from about 1% to about 15% by weight, sulfuric acid at a concentration within a range from about 1% to about 10% by weight, and hydrogen fluoride at a concentration within a range from about 10 ppm to about 1,000 ppm, applying an aliquot of the cleaning solution to a substrate surface for a time period, and rinsing the aliquot

from the substrate surface with water to form a wash solution, as recited in claim 1. Applicant respectfully requests withdrawal of the rejection of claim 1 and of claims 2, 5, and 9-12, which depend thereon.

Similarly, *Ramachandran, et al.* does not teach, show, or suggest a method for cleaning a residue from a substrate surface, comprising combining an aqueous solution comprising sulfuric acid and hydrofluoric acid, wherein a concentration of the sulfuric acid in the aqueous solution is about 70% or less by weight, with a hydrogen peroxide solution at a predetermined weight ratio of about 1 to about 20 to form an intermediate solution at a predetermined temperature of about 3°C or less higher than temperatures of the aqueous solution and the hydrogen peroxide solution, diluting the intermediate solution with water to form a cleaning solution, exposing the substrate surface to an aliquot of the cleaning solution, wherein the cleaning solution comprises hydrogen peroxide at a concentration within a range from about 1% to about 15% by weight, sulfuric acid at a concentration within a range from about 1% to about 10% by weight, and hydrogen fluoride at a concentration within a range from about 10 ppm to about 1,000 ppm, and rinsing the substrate surface with water to remove a residue and the aliquot of the cleaning solution, as recited in claim 14. Applicant respectfully requests withdrawal of the rejection of claim 14 and of claims 20 and 24-27, which depend thereon.

Claims 1-2, 5, 9-12, 14, 20, and 24-27 are rejected under 35 U.S.C. § 103(a) as being unpatentable over *Rath, et al.* (U.S. Patent No. 6,630,074). The Examiner states that *Rath, et al.* (U.S. Patent No. 6,630,074) discloses a method of removing residue from a substrate using an etchant composition comprising about 0.01 to about 15 percent by weight of sulfuric acid, about 0.01 to about 20 percent by weight of hydrogen peroxide, or about 1 to about 30 ppm of ozone, and about 0.1 to about 100 ppm of hydrofluoric acid and rinsing the substrate. The Examiner asserts that mixing hydrofluoric acid and sulfuric acid with hydrogen peroxide at different concentrations before further diluting with water would have been obvious since it known to dilute cleaning compositions with water. Applicant respectfully traverses the rejection.

Rath, et al. (U.S. Patent No. 6,630,074) describes a method of forming a cleaning solution that includes mixing 98 percent by weight of sulfuric acid with other

components. Applicant respectfully submits that the Examiner has not identified any motivation or suggestion for using the claimed concentration of 70 % by weight or less of sulfuric acid to form an intermediate solution before further diluting the intermediate solution with water. As *Rath, et al.* (U.S. Patent No. 6,630,074) does not teach or suggest mixing or combining an aqueous solution comprising sulfuric acid and hydrofluoric acid, wherein a concentration of the sulfuric acid in the aqueous solution is about 70% or less by weight, to form an intermediate solution, *Rath, et al.* (U.S. Patent No. 6,630,074) does not teach or suggest all of the limitations of claims 1-2, 5, 9-12, 14, 20, and 24-27. Applicant respectfully requests withdrawal of the rejection of claims 1-2, 5, 9-12, 14, 20, and 24-27.

Claims 1-2, 5, 9-12, 14, 20, 24-27, 38, and 43 are rejected under 35 U.S.C. § 103(a) as being unpatentable over *Rath, et al.* (EP-0918081). The Examiner states that *Rath, et al.* (EP-0918081) discloses a method of removing residue from a substrate using an etchant composition comprising about 0.01 to about 15 percent by weight of sulfuric acid, about 0.01 to about 20 percent by weight of hydrogen peroxide, or about 1 to about 30 ppm of ozone, and about 0.1 to about 100 ppm of hydrofluoric acid and rinsing the substrate. The Examiner asserts that mixing hydrofluoric acid and sulfuric acid with hydrogen peroxide at different concentrations before further diluting with water would have been obvious since it known to dilute cleaning compositions with water. Applicant respectfully traverses the rejection.

Rath, et al. (EP-0918081) describes a method of forming a cleaning solution that includes mixing 98 percent by weight of sulfuric acid with other components. Applicant respectfully submits that the Examiner has not identified any motivation or suggestion for using the claimed concentration of 70 % by weight or less of sulfuric acid to form an intermediate solution before further diluting the intermediate solution with water. As *Rath, et al.* (EP-0918081) does not teach or suggest mixing or combining an aqueous solution comprising sulfuric acid and hydrofluoric acid, wherein a concentration of the sulfuric acid in the aqueous solution is about 70% or less by weight, to form an intermediate solution, *Rath, et al.* (EP-0918081) does not teach or suggest all of the limitations of claims 1-2, 5, 9-12, 14, 20, 24-27, 38, and 43. Applicant respectfully requests withdrawal of the rejection of claims 1-2, 5, 9-12, 14, 20, 24-27, 38, and 43.

Claims 1, 2, 5, 9-10, 14, 20, 24-25, and 38 are rejected under 35 U.S.C. § 103(a) as being unpatentable over *Kuhn-Kuhnenfeld, et al.* (U.S. Patent No. 4,100,014). *Kuhn-Kuhnenfeld, et al.* describes forming an etching solution by mixing 40% weight aqueous hydrofluoric acid, 30% weight aqueous hydrogen peroxide, and concentrated aqueous sulfuric acid of about 98% by weight. *Kuhn-Kuhnenfeld, et al.* does not teach or suggest using a concentration of sulfuric acid of about 70% or less by weight to form an intermediate solution that is then diluted to form the etching solution described therein. Applicant respectfully submits that the Examiner has not identified any motivation or suggestion for using the claimed concentration of 70 % by weight or less of sulfuric acid to form an intermediate solution before further diluting the intermediate solution with water. As *Kuhn-Kuhnenfeld, et al.* does not teach or suggest mixing or combining an aqueous solution comprising sulfuric acid and hydrofluoric acid, wherein a concentration of the sulfuric acid in the aqueous solution is about 70% or less by weight, to form an intermediate solution, *Kuhn-Kuhnenfeld, et al.* does not teach or suggest all of the limitations of claims 1, 2, 5, 9-10, 14, 20, 24-25, and 38. Applicant respectfully requests withdrawal of the rejection of claims 1, 2, 5, 9-10, 14, 20, 24-25, and 38.

Claims 3-4, 17-19, 29-30, 34-35, 37, 40, 42-43, and 45 are rejected under 35 U.S.C. § 103(a) as being unpatentable over *Rath, et al.* (U.S. Patent No. 6,630,074 or EP-0918081) or *Ramachandran, et al.* or *Kuhn-Kuhnenfeld, et al.* in view of *Gotoh, et al.* (U.S. Patent No. 5,650,041). Applicant respectfully traverses the rejection.

As discussed above, *Rath, et al.* (U.S. Patent No. 6,630,074 and EP-0918081), *Ramachandran, et al.*, and *Kuhn-Kuhnenfeld, et al.* do not teach or suggest mixing or combining an aqueous solution comprising sulfuric acid and hydrofluoric acid, wherein a concentration of the sulfuric acid in the aqueous solution is about 70% or less by weight to form an intermediate solution. Applicant further submits that *Gotoh, et al.*, individually or in combination with *Rath, et al.* (U.S. Patent No. 6,630,074 and EP-0918081), *Ramachandran, et al.*, and *Kuhn-Kuhnenfeld, et al.* does not teach or suggest mixing or combining an aqueous solution comprising sulfuric acid and hydrofluoric acid, wherein a concentration of the sulfuric acid in the aqueous solution is about 70% or less by weight, to form an intermediate solution. Thus, *Rath, et al.* (U.S. Patent No. 6,630,074 or EP-0918081) or *Ramachandran, et al.* or *Kuhn-Kuhnenfeld, et al.* in view of *Gotoh, et al.*

does not teach or suggest all of the limitations of claims 3-4, 17-19, 29-30, 34-35, 37, 40, 42-43, and 45. Applicant respectfully requests withdrawal of the rejection of claims 3-4, 17-19, 29-30, 34-35, 37, 40, 42-43, and 45.

Claims 13, 28, and 36 are rejected under 35 U.S.C. § 103(a) as being unpatentable over *Rath, et al.* (U.S. Patent No. 6,630,074 and EP-0918081) or *Ramachandran, et al.* in view of *Oonishi, et al.* (U.S. Patent No. 6,273,959). Applicant respectfully traverses the rejection.

Rath, et al. (U.S. Patent No. 6,630,074 and EP-0918081) and *Ramachandran, et al.* are discussed above. Applicant submits that *Oonishi, et al.* does not teach or suggest any of the elements lacking in *Rath, et al.* (U.S. Patent No. 6,630,074 and EP-0918081) and *Ramachandran, et al.* Thus, *Oonishi, et al.*, individually or in combination with *Rath, et al.* (U.S. Patent No. 6,630,074 and EP-0918081) and *Ramachandran, et al.*, does not teach or suggest all of the elements of claims 13, 28, and 36. Applicant respectfully requests withdrawal of the rejection of claims 13, 28, and 36.

In conclusion, the references cited by the Examiner, alone or in combination, do not teach, show, or suggest the invention as claimed.

Having addressed all issues set out in the Final Office Action, Applicant respectfully submits that the claims are in condition for allowance and respectfully request that the claims be allowed.

Respectfully submitted,



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